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## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant: Joseph A. King

Attorney file: 5783

Serial No.: 10/623,682

Examiner: Tsoy, Elena

Filed: 07/21/2003

Group: 1762

For: DELIVERY SYSTEM AND METHOD OF MAKING ARTICLE

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Alexandria, VA 22313-1450 on 10-20-06 by Appellant's attorney, Carl L. Johnson.

Carl L. Johnson

10-20-06

Date

Honorable Commissioner for Patents

Alexandria, VA 22313-1450

BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**APPELLANT'S APPEAL BRIEF**

Sir:

The PTO did not receive the following  
listed item(s) dirty As it is

**I. REAL PARTY IN INTEREST**

The real party in interest is King Technology Inc., assignee of U.S. Patent Application Serial number 10/623,682; filed on July 21, 2003; titled DELIVERY SYSTEM AND METHOD OF MAKING ARTICLE.

**II. RELATED APPEALS AND INTERFERENCES**

There are no current appeals or interferences related to the above-identified patent application.

**III. STATUS OF CLAIMS**

Claims 8 and 9 to a method of applying a water treatment composition to an article and claims 10 and 12 to a method of making an article for insitu water treatment are currently pending in the above-identified application and have all been rejected final. In regards to claims 1-7, 11 and 13-20, claims 11 and 13-20 have been withdrawn and claims 1-7 have been canceled from the present application and thus are not a part of the present appeal.

**IV. STATUS OF AMENDMENTS**

The present application, currently comprising claims 8, 9, 10, and 12, was rejected final on August 11, 2006. In response to the Examiner's Final rejection of August 11, 2006, a Notice of Appeal was filed on August 31, 2006.

## **V. SUMMARY OF CLAIMED SUBJECT MATTER**

Appellant's claims 8 and 9 are grouped together with independent claim 8 standing alone on its own. Appellant's claims 10 and 12 are grouped together with independent claim 10 standing alone on its own.

In regards to Appellant's independent claim 8, Appellant's independent claim 8 calls for a method of applying a water treatment composition to an article comprising the steps of applying an adhesive to a web of material; applying a metal ion yielding material in particle form to the adhesive on the web; allowing the adhesive to dry to secure the metal ion yielding material to the web of material; and forming the particle containing web into an article for use in water purification. Support for Appellant's independent claim 8 can be found for example on page 10, lines 1-7 and in Figures 1, 2, 3, 4, and 7 of the Appellant's disclosure.

In regards to Appellant's independent claim 10, Appellant's independent claim 10 calls for a method of making an article for insitu water treatment comprising the steps of selecting a water treatment material from the group consisting of zinc sulfate, zinc carbonate, zinc chloride, copper chloride, copper carbonate, copper sulfate, silver chloride, stannous chloride and stannic chloride; selecting an adhesive from the group consisting of polyurethane, epoxy resin, polyvinyl acetate and polyvinyl alcohol; selecting a water insoluble solid structure; applying the adhesive to the water insoluble solid structure to form at least a partial coating thereon; applying the water treatment material to the

adhesive on said solid structure; allowing the adhesive to set to thereby secure the water treatment material to the solid structure; and forming the structure into an article for placement into a body of water to thereby enable the structure to adhesively support the water treatment material thereon in a condition that maintains a water concentration of metal ions less than 1000 parts per billion (ppb). Support for Appellant's independent claim 8 can be found for example on page 5, lines 1-27; page 6, lines 1-26; page 10, lines 1-7; and in Figures 1, 2, 3, 4, and 7 of the Appellant's disclosure.

#### **VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

1. Whether the references of KR 8902848, the reference of Minami and the reference of Takahashi et al. each teach the step of applying a metal ion yielding material in particle form to the adhesive on the web?
2. Whether the reference of JP 78020780 teaches the step of allowing the adhesive to dry to secure the metal ion yielding material to the web of material?
3. Whether the reference of Rouse et al. supports the use of the terms "drying" and "curing" interchangeably in the Appellant's field of art?
4. Whether the reference of JP 780100390 teaches the method of applying a water treatment composition to an article as called for in Appellant's claims 8 and 9 or the

method of making an article for in situ water treatment as called for in Appellant's claim 10?

- a. Whether the reference of JP 780100390 does not teach the step of applying an adhesive to a web of material, the step of applying a metal ion yielding material in particle form to the adhesive on the web, or the step of forming the particle containing web into an article for use in water purification.
  - b. Whether the reference of JP 780100390 teaches the steps of applying an adhesive to the water insoluble solid structure, the step of forming the solid structure into an article for placement into a body of water, or the step of forming the structure into an article for placement into a body of water?
5. Whether the combination of the references of the KR 8902848 and Minami or Takahaski et al in view of the reference of Rosenblatt each teach the step of applying a metal ion yielding material in particle form to the adhesive on the web, the step of allowing the adhesive to dry to secure the metal ion yielding material to the web of material of Appellant's claims 8 and 9 or the step of allowing the adhesive to set to thereby secure the water treatment material to the solid structure?

## **VII. ARGUMENT**

In the Final Office Action dated August 11, 2006, the Examiner rejected Appellant's claims 8 and 9 under 35 U.S.C. 102(b) as being anticipated by the reference KR 8902848, the reference of Minami (U.S. Patent No. 3,866,568) or the reference of Takahashi et al. (U.S. Patent No. 5,567,539); rejected claims 8-10 under 35 U.S.C. 102(b) as being anticipated by the reference JP780100390; rejected claims 8 and 9 under 35 U.S.C. 102(b) as being anticipated by the reference JP 78020780; rejected claims 8-10 under 35 U.S.C. 103(a) as being made obvious by the reference JP780100390; rejected claims 8 and 9 under 35 U.S.C. 103(a) as being made obvious by the reference JP 78020780; rejected claims 8 and 9 under 35 U.S.C. 103(a) as being unpatentable over KR 8902848 in view of the reference of Oehler et al. (U.S. Patent No. 5,820,927); rejected claims 8-10, and 12 under 35 U.S.C. 103(a) as being unpatentable over KR 8902848/JP 780100390/JP 78020780 in view of the reference of Rosenblatt (U.S. Patent No. 6,365,169); and rejected claim 10 under 35 U.S.C. 102(b) as being anticipated by the reference JP78020780.

In regards to claims 1-7, 11 and 13-20, claims 11 and 13-20 have been withdrawn and claims 1-7 have been canceled from the present application and thus are not a part of the present appeal.

1. **The references of KR 8902848, the reference of Minami and the reference of Takahashi et al. each do not teach the step of applying a metal ion yielding material in particle form to the adhesive on the web.**

Appellant's method claims 8 and 9 stand rejected under 35 U.S.C. 102(b) as being anticipated by the reference KR 8902848, the reference of Minami (U.S. Patent No. 3,866,568) or the reference of Takahashi et al. (U.S. Patent No. 5,567,539). The Appellant respectfully disagrees with the Examiner's aforementioned rejection of Appellant's method claims 8 and 9.

In regards to Appellant's independent method claim 8, Appellant's independent method claim 8 calls for a method of applying a water treatment composition to an article including the step of:

“...applying a metal ion yielding material in particle form to the adhesive on the web ....” (Emphasis added.)

The Appellant respectfully submits that a review of the references of Minami and Takahashi et al. reveal that the references of Minami and Takahashi et al. each do not teach the step of applying metal ion yielding materials in particle form to an adhesive on a web as called for in Appellant's independent method claim 8. On page 5, lines 3-5 of the Office Action dated April 11, 2006, the Examiner commented:

“...each of Minami and Takahashi et al is applied not for teaching the step of applying metal ions yielding materials in particle form to an adhesive on a web, but

as evidence to confirm the Examiner's interpretation of the term "drying" of holt [hot] metal adhesive." (Emphasis added.)

The Appellant respectfully disagrees with the Examiner's citation of the reference of Minami and the reference of Takahashi et al. in the Examiner's rejection of Appellant's method claims 8 and 9 under 35 U.S.C. 102(b). More specifically, the Appellant respectfully submits that if the reference of Minami and the reference of Takahashi et al each does not teach "... the step of applying metal ions yielding materials in particle form to an adhesive on a web..." as called for in Appellant's method claims 8 and 9, then the Examiner's rejection of Appellant's method claims 8 and 9 under 35 U.S.C. 102(b) as being anticipated by the reference of Minami or the reference of Takahashi et al. is not a proper rejection. In the case of *Atlas Powder Co. v. IRECO Inc.*, wherein the Federal Circuit held:

"To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently." Emphasis added, see *Atlas Powder Co. v. IRECO Inc.*, 51 USPQ2d 1943, 1945 (Fed. Cir. 1999), citing *In re Schreiber*, 44 USPQ 1429, 1477 (Fed. Cir. 1997)

In view of *Atlas Powder Co. v. IRECO Inc.*, it is respectfully submitted that since the references of Minami and Takahashi et al each is applied not for teaching the step of applying metal ions yielding materials in particle form to an adhesive on a web as called for in Appellant's method claims 8 and 9, the Appellant respectfully submits that Appellant's method claims 8 and 9 are allowable over the references of Minami and Takahashi et al.



It is for the above reasons that the Appellant respectfully submits that Appellant's method claims 8 and 9 are allowable over the reference of Minami and the reference of Takahashi et al.

In regards to the reference KR 8902848, the Examiner on page 4, lines 16-20 of the Office Action dated April 11, 2006, in support of the Examiner's rejection of Appellant's claim 10 under U.S.C. 102(b) as being anticipated by the reference JP 78020780, stated:

“..., the translated text (See USPTO translation) describes the relevant part as follows: “When forming the filter 8, one side of the non-woven fabric 11' and 11” is coated with an adhesive, and the adhesive-coated side is **fusion bonded to the activated carbon** to fix the activated carbon” (See page 4, lines 20-22).”

The Appellant respectfully submits that the above disclosure of the fusion bonding of activated carbon to a side of KR 8902848's non-woven fabric containing an adhesive coating does not anticipate the Appellant's step of applying of metal ion yielding material in particle form to the adhesive as called for in Appellant's independent method claim 10.

It is respectfully submitted that the reference of KR 8902848 is unclear whether the activated carbons are fusion bonded to the adhesive or the non-woven fabric itself. It is respectfully submitted that it is more likely that the reference KR 8902848 teaches that the activated carbons are fusion bonded to the non-woven fabric itself and not to the adhesive as the generally adhesion properties of an adhesive would alleviate the need for fusion bonding if KR 8902848's activated carbon were applied directly to KR 8902848's adhesive.

The Appellant respectfully further notes that the Examiner is currently rejecting Appellant's claims 8 and 9 under 35 U.S.C. 102(b) as being anticipated by the references KR 8902848. In *ATD Corp. v. Lydall, Inc.*, the Federal Circuit held that in order for a reference to anticipate, the:

“... anticipating reference must describe the patented subject matter with sufficient clarity and detail to establish that the subject matter existed and that its existence was recognized by persons of ordinary skill in the field of the invention.”<sup>1</sup>  
(Emphasis added.)

In view of *ATD Corp. v. Lydall, Inc.*, the Appellant respectfully submits that the KR 8902848 reference does not anticipate Appellant's independent method claim 8 as the reference KR 8902848 does not describe with sufficient clarity and detail the use and function of the adhesive so as to anticipate the step of “...applying a metal ion yielding material in particle form to the adhesive on the web” of Appellant's independent method claim 8.

In regards to the KR 8902848 reference's disclosure of the adhesive, the Appellant respectfully submits under *In re Oelrich*<sup>2</sup> that the mere disclosure of an adhesive coating the inner side of the nonwoven fabrics is not sufficient to lead to the conclusion that the silver-added active carbon and untreated active carbon of the KR 8902848 reference are

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<sup>1</sup> *ATD Corp. v. Lydall, Inc.*, 48 USPQ 2d 1321, 1328 (Fed. Cir. 1998)

<sup>2</sup> *In re Oelrich*, 212 USPQ 323, 326 (C.C.P.A.) (quoting *Hasgigirg v. Kemmer*, 40 USPQ 665, 667 (C.C.P.A. 1939) (“Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.”)

actually applied to the adhesive. Note per the Appellant's above argument that the KR 8902848 reference actually teaches away from the application of the active carbons to the adhesive through the disclosure that the mesh formed by KR 8902848's fabrics 11' and 11'' already functions to prevent the active carbon from escaping or releasing from KR 8902848's filter 8.

In further regards to the KR 8902848 reference, it is respectfully noted that although the reference KR 8902848 (in the abstract) discloses in parentheses that the inner side of the nonwoven fabrics is coated with adhesive, the Appellant respectfully submits that the adhesive cited in KR 8902848 is for bonding KR 8902848's sheets of fabrics 11' and 11'' together to prevent the sheets of fabrics 11' and 11'' from blistering. (See page 4 of the Appellant's translation of the KR 8902848 reference.) The Appellant further submits that the KR 8902848 reference teaches away from the use of an adhesive to secure the silver-added active carbon and untreated active carbon to fabrics 11' and 11'' through the disclosure on page 4, lines 24-26 of the Appellant's translation of the KR 8902848 reference that:

“... the mesh of the fabrics is finer than the activated carbon, which thereby is prevent from being release.”

In view of KR 8902848's above disclosure, the Appellant respectfully submits that there lacks a need for securement of the silver-added active carbon and untreated active carbon to KR 8902848's fabrics 11' and 11'' as the mesh formed by fabrics 11' and 11'' already functions to prevent the silver-added active carbon and untreated active carbon from

escaping or releasing from filter 8. (See Figures 3, 4, 5, and 6 of the KR 8902848 reference.)

It is for the above reasons that the Appellant submits that the references of KR 8902848, the reference of Minami and the reference of Takahashi et al. each do not teach the step of applying a metal ion yielding material in particle form to the adhesive on the web and that Appellant's independent method claim 8 is allowable over the reference KR 8902848, the reference of Minami and the reference of Takahashi et al.

**2. The reference of JP 78020780 does not teach the step of allowing the adhesive to dry to secure the metal ion yielding material to the web of material.**

Appellant's claims 8 and 9 call for a "... method of applying a water treatment composition to an article ..." including the step of:

"... allowing the adhesive to dry to secure the metal ion yielding material to the web of material."

On page 6, lines 12-19 of the Office Action dated April 11, 2006, the Examiner stated:

"..., JP 78020780 discloses a sterilizing element for water purification apparatus (claimed filter) comprising adhering a water-insoluble silver salt containing powder to a flexible film with a **epoxy resin** binder (See Abstract). It is well known in the art that *resins* can be formulated either as water based or as solvent based. In both cases the epoxy resin binder should be dried to secure powder to the plate (note that adhesive of any kind should be dried (cooled, cured), as evidenced by JP 51067462 (See Abstract) or solvent removing to secure an object to a substrate).

The specification as filed also describes the use of epoxy resin as an adhesive, which supposed to be dried to secure metal ion yielding particles (See page 6, line 9)."

The Appellant respectfully disagrees with the Examiner's above comments that "...adhesive of any kind should be dried..." It is submitted that the main purpose of an adhesive is to function to adhere one article to another article. Although an adhesive can adhere through a drying process, it is respectfully submitted that an adhesive can also adhere without having to dry. Note for example adhesives that adhere under water.

In further regards to Appellant's claims 8 and 9, on page 5, lines 10-19 of the Office Action dated April 11, 2006, the Examiner stated:

"The Applicant cannot strenuously object to the Office's use of the term "dried" because Applicants' specification does not define the term "drying" as being NOT interchangeable with the terms "cooled" and "cured."

The Appellant respectfully disagrees with the Examiner's above comments. Although the Appellant agrees that "... pending claims must be given the broadest reasonable interpretation consistent with the specification,..." the Appellant respectfully submits that the Appellant's specification does not support the Examiner's interpretation of the term "dry" as being interchangeable with the term "cure" or "cured."

In regards to the Examiner's comments that the Appellants' specification does not define the term "drying" as being NOT interchangeable with the term "cured," the Appellant respectfully submits that it would be an undue burden to require an Appellant to provide a

laundry list of terms in the specification that are not interchangeable with terms used in the claims. It is further respectfully submitted that in situations in which a common term found in the claim is not specifically defined in the specification, use of a dictionary has been held to be proper to help determine the common meaning of the term. (See for example *American Permahedge, Inc. v. Barcana, Inc.*, 41 USPQ 2d 1614, 1616-17 (Fed. Cir. 1997))

In view of the above, the Appellant respectfully submits that the term “dry” is defined on page 248 of *WEBSTER’S UNIVERSAL COLLEGE DICTIONARY* as:

“1. free from moisture; not moist; not wet .... 14. dehydrated ... 26. to make dry; free from moisture: to dry the dishes. – v.i. 27. to become dry; lose moisture ...”  
(Take from *WEBSTER’S UNIVERSAL COLLEGE DICTIONARY*, © 1997, page 248, by Random House, Inc. New York, New York)

The Appellant has enclosed a copy of page 248 of *WEBSTER’S UNIVERSAL COLLEGE DICTIONARY* with the present response. It is respectfully submitted that the above definition for the term “dry” involves the removal of moisture or being free of moisture. It is noted however that *WEBSTER’S UNIVERSAL COLLEGE DICTIONARY* does not define the term “dry” or “drying” as being interchangeable with the term “cure” or “cured.”

Further note that *WEBSTER’S UNIVERSAL COLLEGE DICTIONARY* does not even provide any reference(s) to the term “cure” or “curing” in its definition for the term “dry.”  
(See page 248 of *WEBSTER’S UNIVERSAL COLLEGE DICTIONARY*.)

It is for the above reasons that the Appellant respectfully submits that the Appellant’s specification does not support the Examiner’s interpretation of the “dry” as being

interchangeable with the term “cure” or “cured” and thus that the reference of JP 78020780 does not teach the step of allowing the adhesive to dry to secure the metal ion yielding material to the web of material.

**3. The reference of Rouse et al does not support the use of the terms “drying” and “curing” interchangeably in the Appellant’s filed of art.**

On page 4, lines 7-8 of the Office Action dated April 11, 2006, the Examiner stated:

“Rouse et al (US 6238448) shows that terms “drying” and “curing” are used in the art interchangeably (See column 10, lines 2-3).” (Emphasis added.)

The Appellant respectfully disagrees with the Examiner’s above citation of the reference of Rouse et al as supporting the Examiner’s position that the terms “drying” and “curing” are used in the art interchangeably. The Appellant respectfully notes that the reference of Rouse et al. is directed to the art of comminuting devices and more specifically grinding stones (column 1, lines 13-25). The Appellant’s field of art is directed to water treatment mechanisms. It is respectfully submitted that the art of grinding stones is unrelated to the art of water treatment mechanisms.

In view of the aforementioned, the Appellant respectfully submits that Rouse et al.’s use of the terms “drying” and “curing” should not be construed against the Appellant’s claims as the reference of Rouse et al does not support the use of the terms “drying” and “curing” interchangeably in the Appellant’s filed of art.

4. **The reference of JP 780100390 does not teach the method of applying a water treatment composition to an article of Appellant's claims 8 and 9 or the method of making an article for in situ water treatment of Appellant's claim 10.**
- a. **The reference of JP 780100390 does not teach the step of applying an adhesive to a web of material, the step of applying a metal ion yielding material in particle form to the adhesive on the web, or the step of forming the particle containing web into an article for use in water purification.**

Appellant's method claims 8 and 9 each calls for a "... method of applying a water treatment composition to an article ..." including the steps of:

    "... applying an adhesive to a web of material;  
    ... applying a metal ion yielding material in particle form to the adhesive on the web; ...  
    ...forming the particle containing web into an article for use in water purification." (Emphasis added.)

On page 3, lines 4-8 of the Office Action dated April 11, 2006, the Examiner rejected Appellant's claims 8- 10 under U.S.C. 102(b) as being anticipated by the reference JP 780100390. In support of the Examiner's aforementioned rejection, the Examiner on page 3, lines 6-8 of the Office Action stated:

    "Note that a film shaped device prepared by bonding silver-salt particles to an adhesive 22 applied to a flexible substrate 21 (See Fig. 6) is used for forming a water filtering system (See Figs. 3, 5; Translation, pages 7-8)."



The Appellant respectfully submits that the reference JP 780100390 does not teach the above-mentioned steps of Appellant's method claims 8 and 9. It is respectfully noted that the reference of JP 780100390 instead teaches and shows (in Figure 6) the application of a resin adhesive 22 to a flexible substrate 21. The Appellant respectfully submits that JP 780100390's flexible substrate 21 is not a web of material. Further note that JP 780100390's resin adhesive 22 and flexible substrate 21 are eventually secured (simultaneously) to JP 780100390's meshed porous resin frame 10. (See Figure 3 of JP 780100390's) It is submitted that JP 780100390's meshed porous resin frame 10 supports JP 780100390's flexible substrate thereon or therebetween during use as shown in Figures 3 and 4 of JP 780100390.

It is for the above reasons that the Appellant respectfully submits that the reference of JP 780100390 does not teach the step of applying an adhesive to a web of material, the step of applying a metal ion yielding material in particle form to the adhesive on the web, or the step of forming the particle containing web into an article for use in water purification and that Appellant's independent claims 8 and 9 are allowable over the JP 780100390 reference.

- b. The reference of JP 780100390 does not teach the steps of applying an adhesive to the water insoluble solid structure, the step of forming the solid structure into an article for placement into a body of water, or the step of forming the structure into an article for placement into a body of water.**

Appellant's method claim 10 calls for a method of making an article for in situ water treatment including the steps of:

“... applying the adhesive to the water insoluble solid structure to form at least a partial coating thereon;  
applying the water treatment material to the adhesive on said solid structure;  
allowing the adhesive to set to thereby secure the water treatment material to the solid structure; and  
forming the structure into an article for placement into a body of water to thereby enable the structure to adhesively support the water treatment material thereon in a condition that maintains a water concentration of metal ions less than 1000 parts per billion (ppb).” (Emphasis added.)

The Appellant respectfully submits that the reference JP 780100390 does not teach the above-mentioned step of “...applying the adhesive to the water insoluble solid structure...” or the step of “... forming the structure into an article for placement into a body of water...” The reference of JP 780100390 instead teaches and shows (in Figure 6) the application of a resin adhesive 22 to a flexible substrate 21. The Appellant respectfully submits that JP 780100390's flexible substrate 21 is not a solid structure.

The Appellant submits that the reference JP 780100390 also does not teach the above-mentioned step of “...forming the structure into an article for placement into a body of water ...” Reference 780100390 instead teaches the simultaneously securement of the flexible substrate 21 containing the resin adhesive 22 and silver salt particles 23 to JP 780100390's meshed porous resin frame 10. (See Figure 3 of JP 780100390's) JP

780100390's flexible substrate is supported on or between JP 780100390's meshed porous resin frame 10 during use as shown in Figures 3 and 4 of JP 780100390.

It is for the above reasons that the Appellant respectfully submits that the reference of JP 780100390 does not teach the steps of applying an adhesive to the water insoluble solid structure, the step of forming the solid structure into an article for placement into a body of water, or the step of forming the structure into an article for placement into a body of water and that Appellant's independent method claim 10 is allowable over the JP 780100390 reference.

5. **The combination of the references of the KR 8902848 and Minami or Takahaski et al in view of the reference of Rosenblatt each do not teach the step of applying a metal ion yielding material in particle form to the adhesive on the web or the step of allowing the adhesive to dry to secure the metal ion yielding material to the web of material or the step of allowing the adhesive to set to thereby secure the water treatment material to the solid structure.**

Appellant's independent method claims 8 and 9 each calls for a method of applying a water treatment composition to an article including the step of "... applying a metal ion yielding material in particle form to the adhesive on the web..." and the step of "... allowing the adhesive to dry to secure the metal ion yielding material to the web of material." (Emphasis added.) Appellant's independent method claim 10 calls for a method of making an article for insitu water treatment including the step of:

“... applying the water treatment material to the adhesive on said solid structure; allowing the adhesive to set to thereby secure the water treatment material to the solid structure;” (Emphasis added.)

On page 3, lines 15-18 of the Office Action dated April 11, 2006, the Examiner rejected Appellant’s claims 8-10 and 12 under U.S.C. 103(a) as being unpatentable over KR 8902848/JP 780100390/JP 78020780 in view of the reference of Rosenblatt (U.S. Patent No. 6,365,169). In support of the Examiner’s aforementioned rejection, the Examiner on page 6, lines 1-3 stated:

“Rosenblatt teaches curing (setting) of his PVA with iodine and other antimicrobial components in order to secure the iodine and other antimicrobial components to Rosenblatt’s substrate (See column 8, lines 9).”

The Appellant strenuously but respectfully disagrees with the Examiner’s above statement. The Appellant respectfully submits that Rosenblatt’s column 8, lines 9-12 does not teach the curing or setting of Rosenblatt’s PVA with iodine to Rosenblatt’s substrate. Rosenblatt’s column 8, lines 9-12 instead teaches curing Rosenblatt’s various substrates to provide Rosenblatt’s substrates with “...iodine complexing potential...”, that is (referring back to column 3, lines 43-45 of Rosenblatt) the ability to complex “...with an iodine solution containing excess iodine.”

In further regards to the Examiner’s above rejection, the Appellant respectfully notes that the reference of Rosenblatt does not call for the application of iodine, which Rosenblatt uses as a disinfectant, to the PVA locate on Rosenblatt’s substrate in particle form.

Rosenblatt instead teaches the “complexing” of iodine in solution or liquid form to Rosenblatt’s substrate. (See column 3, lines 43-45 of Rosenblatt.) The Appellant respectfully submits that the application of iodine to a substrate in particle form is different from the “complexing” of iodine to a substrate in solution or liquid form.

The Appellant also submits that using PVA, as taught by Rosenblatt, in KR 8902848 and Minami or Takahaski et al. as an adhesive does not make the above mentioned limitations of Appellant’s claim 8-10 obvious as the reference of Rosenblatt does not call for the drying or the curing of his PVA with the iodine applied thereto in order to secure the iodine to Rosenblatt’s substrate. Note that Rosenblatt instead teaches that the PVA is dried and cured to the Rosenblatt’s substrate before the iodine is applied thereto. (See column 3, lines 39-45 of Rosenblatt.) More specifically, in column 3, lines 39-45, Rosenblatt states:

“The cured PVA impregnated substrate is washed, if necessary, and is then complexed with iodine solution containing excess iodine. The sponge is rinsed out to flush out the excess iodine.”

It is for the above reasons that the Appellant respectfully submits that the combination of the references of the KR 8902848 and Minami or Takahaski et al in view of the reference of Rosenblatt each do not teach the step of applying a metal ion yielding material in particle form to the adhesive on the web or the step of allowing the adhesive to dry to secure the metal ion yielding material to the web of material or the step of allowing the adhesive to set to thereby secure the water treatment material to the solid and that Appellant’s claims 8-10

is allowable over the references of KR 8902848 and Minami or Takahaski et al in view of the reference of Rosenblatt.

In further regards to Appellant's claims 9 and 12, Appellant's dependent claim 9 depends on Appellant's independent claim 8 and Appellant's dependent claim 12 depends on Appellant's independent claim 10. Since Appellant's independent claim 8 and Appellant's independent claim 10 are allowable for the reasons given above, Appellant's dependent claims 9 and 12 should also be allowable.

In summary, it is respectfully submitted that the Examiner was incorrect in rejecting Appellant's claims 8 and 9 under U.S.C. 102(b) as being anticipated by the reference KR 8902848, the reference of Minami or the reference of Takahashi et al.; claims 8-10 under 102(b) as being anticipated by the reference JP780100390; claims 8 and 9 under U.S.C. 102(b) as being anticipated by the reference JP 78020780; claims 8-10 under U.S.C. 103(a) as being made obvious by the reference JP780100390; claims 8 and 9 under U.S.C. 103(a) as being made obvious by the reference JP 78020780; claims 8 and 9 under U.S.C. 103(a) as being unpatentable over KR 8902848 in view of the reference of Oehler et al.; claims 8-10, and 12 under U.S.C. 103(a) as being unpatentable over KR 8902848/JP 780100390/JP 78020780 in view of the reference of Rosenblatt (U.S. Patent No. 6,365,169); and claim 10 under U.S.C. 102(b) ) as being anticipated by the reference JP78020780. Accordingly, it is respectfully requested that the decision of the Examiner be reversed and that Appellant's claims 8, 9, 10, and 12 be allowed.

Respectfully submitted,

**JACOBSON AND JOHNSON**

By 

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CLJ/tp  
Enclosures

**VIII. CLAIMS APPENDIX**

Claims involved in the appeal:

- 1 - 7. (Canceled)
8. (Previously Presented) A method of applying a water treatment composition to an article comprising the steps of:
- a) applying an adhesive to a web of material;
  - b) applying a metal ion yielding material in particle form to the adhesive on the web;
  - c) allowing the adhesive to dry to secure the metal ion yielding material to the web of material; and
  - d) forming the particle containing web into an article for use in water purification.
9. (Original) The method of claim 8 wherein the particle containing web is formed into a filter.
10. (Original) A method of making an article for insitu water treatment comprising the steps of:
- selecting a water treatment material from the group consisting of zinc sulfate, zinc carbonate, zinc chloride, copper chloride, copper carbonate, copper sulfate, silver chloride, stannous chloride and stannic chloride;



selecting an adhesive from the group consisting of polyurethane, epoxy resin, polyvinyl acetate and polyvinyl alcohol;

selecting a water insoluble solid structure;

applying the adhesive to the water insoluble solid structure to form at least a partial coating thereon;

applying the water treatment material to the adhesive on said solid structure;

allowing the adhesive to set to thereby secure the water treatment material to the solid structure; and

forming the structure into an article for placement into a body of water to thereby enable the structure to adhesively support the water treatment material thereon in a condition that maintains a water concentration of metal ions less than 1000 parts per billion (ppb).

11. (Withdrawn) The method of claim 10 wherein the selected adhesive and selected water treatment material are combined in a slurry and simultaneously coated onto the structure using a die coater.

12. (Original) The method of claim 10 wherein the selected adhesive is sprayed on the solid structure and the selected water treatment material is applied to the adhesive on the structure.

13. (Withdrawn) The method of claim 10 wherein the selected adhesive is roll coated onto the structure and the selected water treatment material is applied to the roll coated adhesive on the structure.
14. (Withdrawn) The method of claim 10 wherein the selected adhesive is die coated onto the structure and the selected water treatment material is applied to the die coated adhesive on the structure.
15. (Withdrawn) The method of claim 10 wherein the solid structure is immersed into the selected adhesive and the selected water treatment material is applied to the adhesive after the structure is removed from the adhesive.
16. (Withdrawn) The method of claim 10 wherein the selected adhesive applied to the solid structure is limited by a knife and the selected water treatment material is applied to the adhesive on the structure.
17. (Withdrawn) The method of claim 10 wherein the selected adhesive is roll coated onto the structure and the selected water treatment material is roll coated on the adhesive on the structure.
18. (Withdrawn) A process of making a water treatment composition including the steps of:

- a) mixing a first amount of silver nitrate into a first batch of water to form a silver nitrate mixture;
- b) mixing a first amount of sodium chloride into the silver nitrate mixture to form a silver chloride mixture;
- c) mixing an adhesive securable to both silver chloride and to support particles into a second batch of water to form an adhesive mixture;
- d) combining the silver chloride mixture and the adhesive mixture to form an adhesive silver chloride mixture;
- e) applying the adhesive silver chloride mixture to support particles; and
- f) curing the adhesive silver chloride mixture insitu on the support particles to form support particles having a coating containing silver chloride.

19. (Withdrawn) The process of making a water treatment composition according to claim 18 wherein mixing an adhesive into a second batch of water includes mixing polyvinyl acetate adhesive into a second batch of water.

20. (Withdrawn) The process of making a water treatment composition according to claim 18 wherein mixing an adhesive into a second batch of water includes mixing polyurethane adhesive into a second batch of water.

**IX. EVIDENCE APPENDIX**

A copy of page 248 of *WEBSTER'S UNIVERSAL COLLEGE DICTIONARY*, © 1997, by Random House, Inc. New York, New York.

A copy of Appellant's translation of the KR 8902848 reference.

A copy of Examiner's translation of the JP 78020780 reference.

A copy of Examiner's translation of the JP 78010390 reference.

**X. RELATED PROCEEDING APPENDIX**

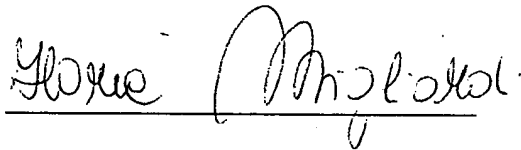
None



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## CERTIFICATE OF ACCURACY

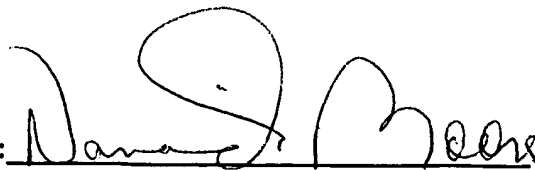
This is to certify that the attached document, Korean Intellectual Property Office (KR), Patent Publication (B1), Application No.: Patent 1986-0009396, has been translated from Korean into English by staff members of THE LANGUAGE LAB familiar with both the Korean and English languages, and is to the best of our knowledge, ability and belief a true and accurate translation.



For THE LANGUAGE LAB

Sworn to and subscribed before me  
this 16<sup>th</sup> day of May, 2005

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25 (54) Title: STERILIZATION AND PURIFICATION FILTER FOR ION WATER  
PURIFIER

*Summary*

(N/A)

30

*Representative drawing: Figure 1*

## *Specification*

[Title of the Invention] Sterilization and purification filter for ion water purifier

5 [Brief Description of the Drawings]

Fig. 1 is a sectional view of a conventional ion water purifier.

Fig. 2 is a sectional view of an ion water purifier containing a filter according to the invention.

Fig. 3(a) is a partially exploded perspective view of the filter of the invention.

10 Fig. 3(b) is a transversal cross-section of the filter of the invention.

Fig. 4 is an enlarged view of silver-added activated carbon according to the invention.

Figs. 5(a) and 5(b) are respectively a partially exploded perspective view and a sectional view of a filter according to the invention where the filter is mounted in a housing.

15 Fig. 6 is a graph showing variation in the number of bacteria with the time of electrolysis.

\* Reference numerals in the drawings

8: Filter      9: Housing    10: flow passageway

20 11', 11'': Non-woven fabric      12': Silver-added activated carbon

12'': Untreated activated carbon

[Detailed Description of the Invention]

The present invention relates to a sterilization and purification filter to be used in an  
 25 ion water purifier. More specifically, the invention relates to such a filter, in which  
 silver-added activated carbon is pressed into a non-woven fabric, which is contained  
 in a plastic housing with a flow passageway, and thereafter the housing is installed in  
 the cathode chamber of an ion water purifier, thereby removing bacteria, organic  
 materials, and impurities, which remain in the alkaline water produced in the ion  
 30 water purifier. The ion water purifier is a device, in which alkaline drinking water  
 containing a high concentration of (+) ions such as calcium, potassium and sodium is

generated in the cathode chamber. Also, in the anode chamber, a cosmetic water of acidity featuring a high concentration of (-) ions such as chlorine and sulfur is produced. As shown in Fig. 1, a diaphragm 34 is installed in a container 31, which thereby is divided into a cathode chamber 32 and an anode chamber 33. The two chambers 35 and 36 are filled with electrolyte water, to which the corresponding electrodes 35 and 36 are added and a DC voltage is applied, thereby causing an electrolytic action. The anode employs a ferrite electrode and the cathode employs a stainless steel electrode. The water contained in the chamber is electrolyzed to produce alkaline water and acidic water in the respective chambers.

Here, although it varies with the time of electrolysis, the alkaline water has a pH of 4~5. This alkaline water can be used as beautifying water for skin cosmetics. In other words, the alkaline water can be used for improving one's physical condition, so that the acidic physical condition due to acid foods can be changed into a weak alkaline condition, which would improve health, and antibacterial skin (weak acidic) can be prevented from changing into an alkaline skin, due to aging of skin.

The conventional ion water purifier is configured in such a manner that it exhibits a sterilizing effect in the alkaline or acid pH range, not in the neutral pH range (around pH 7) where bacteria remain alive. However, as shown in the graph of Fig. 6, the acid water is completely sterilized around pH of 4.5, and the alkaline water is not highly sterilized even after the time of electrolytic dissociation. In addition, since tap water or underground water is used and electrolyzed, impurities contained in the tap water or underground water is deposited at the bottom of the container and then discharged together with the purified water. Thus, the impurities and bacteria contained therein are absorbed by the body upon consumption of the purified water.

The present invention provides complete sterilization and purification for an ion water purifier. According to the invention, a certain amount of water-soluble silver salt is adsorbed between upper and lower non-woven fabrics which feature a good air-permeability. Then, silver-added activated carbon, which is produced by reacting



with chloride salts having the same equivalent, and a non-treated activated carbon are alternately loaded to form a filter, which is then held in a housing with a flow passageway, which enables the filtering and sterilizing of alkaline water. The present invention will be described in detail, with reference to the accompanying drawings.

5

Fig. 2 is a sectional view of an ion water purifier equipped with a filter according to the invention. The ion water purifier includes a container 1, in the middle of which a diaphragm 4 featuring a multitude of holes forms a cathode chamber 2 for producing alkaline water having (+) ions and an anode chamber 3 for producing acidic water  
10 having (-) ions. The lower end of the respective chambers 2 and 3 features an outlet hole 2a and 3a for water drainage. The cathode chamber 2 contains a plastic housing 9 containing a filter 8, which performs a filtering and sterilizing function. An anode 5 and a cathode 6 are installed in the anode chamber 3 and the cathode chamber respectively to apply a DC voltage and thus perform water electrolysis.

15

A ferrite electrode and a stainless steel electrode are used as the anode 5 and the cathode 6, respectively. As illustrated in Fig. 3, the filter 8 is constructed in such a manner that a silver-added activated carbon 12' and an untreated activated carbon 12'' are alternately arranged between upper and lower non-woven fabrics 11' and 11''  
20 featuring air-permeability. When forming the filter 8, one side of the non-woven fabrics 11' and 11'' is coated with an adhesive, and the adhesive-coated side is fusion-bonded to the activated carbon to fix the activated carbon.

Due to the above adhesive bonding, the fabrics are prevented from blistering. In  
25 addition, the mesh of the fabrics is finer than the activated carbon, which thereby is prevented from being released.

The silver-added activated carbon 12', one of the major components of the invention, is made as follows: First, in a one-liter round flask, aqueous solution is made, using  
30 10~20 weight percent of silver salts such as water-soluble silver nitrate ( $\text{AgNO}_3$ ) and 80~90 weight percent of distilled water. A dried activated carbon is immersed in the

above solution for 10~20 minutes at room temperature, and thereafter rinsed 3~4 times with distilled water thereby removing excess silver salt, which is not reacted.

At this time, the silver components of the activated carbon are water-soluble and thus easily separated out of the activated carbon, and so the silver components cannot be used for long. Therefore, the silver component must be stabilized through a suitable process. This is, the activated carbon treated with a silver salt is immersed, for 30 minutes, in slightly soluble NaCl solution equivalent to the  $\text{AgNO}_3$  or  $\text{AgCl}_2$ , which are extracted. Thereafter, it is rinsed 3~4 times with distilled water to remove chlorine from the NaCl solution. The resulting activated carbon is dried in an oven at a temperature of 100~120°C to obtain a silver-added activated carbon.

The above described silver-added activated carbon contains 0.3~0.5% silver and thus the silver is separated out in extremely small quantities. The silver ions carry out a sterilizing function. In this embodiment, silver is selected as a metallic element for performing a sterilizing function. Although gold or copper has the same sterilizing function, they are not preferable in terms of cost or usage. Gold is expensive and lacks practicability. Copper is oxidized in water to form rust, which may do harm to the human body. Thus, silver is suitable for this purpose in terms of the reasonable cost and insofar that it harmless for the human body.

When filtering and sterilizing, the silver-added activated carbon 12' has a resistance in water by means of the filter 8. In order to minimize the resistance, the particle size of the activated carbon is preferred to be in a range of 6~10mesh.

In case where the silver-added activated carbon is manufactured as previously described, the fine pores 13 having an adsorbing ability is somewhat damaged, as shown in Fig. 4. Thus, it has a good sterilizing capacity, but the capacity to adsorb organic materials is degraded, as compared with the non-treated activated carbon.

Therefore, in order to improve the adsorption capacity, a common non-treated activated carbon 12" is used with the same content as the silver-added activated carbon. That is, the non-treated activated carbon 12" is arranged between fabrics 11' and 11", which is treated with an adhesive on one side only, and then fusion-bonded to form the filter 8.

As illustrated in Fig. 5, the above described filter 8 is accommodated in a plastic housing that has a flow passageway 10 on the top and bottom. The housing 9 containing the filter 8 is installed in the cathode chamber 2, to which DC power is applied. Then, (-) ions, which are electrically disassociated, flow toward the ferrite electrode (positive electrode) due to the electric voltage, and (+) ions move towards the stainless steel electrode (negative electrode). Consequently, the anode chamber 3 produces acidic water and the cathode chamber 2 produces alkaline water.

During this process, in cathode 2 a metallic constituent of silver, which is solved out in a tiny amount, sterilizes the remaining bacteria. The activated carbon 12" and the fabrics 11' and 11" filter organic materials, thereby producing a hygienic alkaline water, which is discharged through the outlet hole 2a via the flow passageway 10 of the housing 9.

In the sterilizing process, for example, 5.5g of the silver-added activated carbon was immersed in 50cc of well water contaminated with bacteria, which was contained in a Erlenmeyer flask of 100cc, and held for 24 hours. Thereafter, 1cc of the well water was sampled and cultivated at 37°C using an agar. Thus, the well water, which had contained 1,400 bacteria per 1cc, was completely sterilized.

In the conventional ion water purifier, the number of bacteria was reduced to 100 bacteria per 1cc after 30 minutes of electrolysis. As shown in Fig. 6, however, where the filter 8 of the invention was used, it was sterilized to the extent of 3 bacteria per 1cc.

As described above, according to the present invention, a filter containing silver-added activated carbon and common-type activated carbon is installed in the cathode chamber of an ion water purifier to improve sterilization of bacteria and filtering of organic material, thereby producing high quality alkaline water that is harmless for the human body.

*(57) Claims*

1. A sterilization and purification filter for an ion water purifier, the filter being manufactured by preparing upper and lower non-woven fabrics 11' and 11" featuring good air-permeability and coated with an adhesive on one side, adsorbing a certain amount of water soluble silver chloride between the non-woven fabrics, alternately loading a silver-added activated carbon 12' and a non-treated activated carbon 12", the silver-added activated carbon 12' being obtained by reacting NaCl or equivalent, and fusion-bonding the resultant non-woven fabrics 11' and 11".

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요약

내용 없음.

대표도

도1

명세서

[발명의 명칭] 이온정수기용 살균, 정수 필터[도면의 간단한 설명] 제 1 도는 종래의 이온정수기의 단면 상태도.

제 2 도는 본 발명에 따른 필터를 설치한 이온정수기의 단면도.

제 3 (a)도는 본 발명중 필터의 일부를 절결한 사시도이며 (b)는 필터에 대한 횡단면도이고, 제 4 도는 본 발명에 따른 온 첨가 활성탄의 확대도.

제 5 (a), 제 5 (b)도는 본 발명의 필터를 하우징에 넣은 상태에서와 일부 절결사시도와 단면도.

제 6 도는 전리시간에 대한 일반세균의 변화 그래프.

\* 도면의 주요부분에 대한 부호의 설명 8 : 필터, 9 : 하우징, 10 : 유로홈, 11', 11" : 부직포, 12' : 온 첨가 활성탄, 12" : 미처리 활성탄.

[발명의 상세한 설명] 본 발명은 이온수기의 살균정수 필터에 관한 것으로 이온수기에서 생성하는 알칼리수에 완전 살균되지 않고 잔존하는 세균의 제거와 물속에 포함되어 잔존하는 유기물 및 불순물의 제거를 목적으로하여 온점착활성탄을 부직포에 압착시켜 유로홈을 형성한 플라스틱 하우징에 넣어 이온수기의 음극실에 설치하는 이온수기용 살균, 정수 필터에 관한 것이다. 이온수기는 전기분해 작용으로 용기의 음극실내에 칼슘, 칼륨, 나트륨과 같은(+) 이온의 농도가 높은 알칼리수의 용액을 생성시키며 약극실내에는 염소, 황과 같은(-)의 이온농도가 높은 산성수의 미용수용 생성시키는 기기로서 제 1 도와 같이 용기(31)에 격막(34)을 설치하여 음극실(32)과 양극실(33)로 구분하고 상기 두개의 극실(32)(33)에 전해물질인 용수들 채워 물에 각각의 전극(35)(36)을 걸어 DC전압을 인가시켜 전기분해 작용을 일으키는 데 양극에는 페라이트 전극을 걸고, 음극에는 스테인레스 전극을 사용한다. 상기의 전극으로 용수는 각

실에서 전해되어 알칼리성 용수와 산성용수를 생성한다.

이때 알칼리수는 전기분해(전리)되는 시간에 따라 다소 차이가 있으나 피.에이치(P.H)범위는 4-5정도로 된다. 이러한 알칼리수는 산성식품의 섭취로 산성체질화 되어가는 체질을 알칼리화로 전환시켜 건강체질을 이루고 피부의 노화로 인한 항균성의 피부(약산성)가 알칼리화 되어지는 것을 방지하기 위해 피부미용을 위한 세안수로 공급할 수 있다.

그러나 종래의 이온수기에서는 세균의 생존범위인 중성(P.H가7부근)이 아닌 알칼리 또는 산성에서의 살균효과를 나타내게 되어있으나 실제에서는 제 6도의 그래프에서와 같이 산성수는 P.H4.5부근에서 완전살균 되나 알칼리수에는 전리시간의 경과후에서도 높은 살균효과를 나타내지 못하고 있고, 또한 상수도나 지하수를 용기에 직접받아 전기분해 시킴으로 상수도나 지하수에 있는 불순물이 용기바닥에 가라앉아 있다가 취수하는 과정에서 그대로 배물되어 이를 마실 경우 잔존한 세균과 불순물을 마시게되는 제단이 있었던 것이다.

상기와 같은 불완전한 살균과 정수작용에서 완전한 살균과 정수효과를 주기위한 본 발명은 동기성이 좋은 상하의 부직포 사이로 수용성온염을 일정량 흡착시킨다음 같은 당량으로 염화염을 반응 시켜서된 은 첨가활성탄과 미처리 활성탄을 교호 반복적인 배열로 장입하여 필터를 형성하고 이를 유로공이 천공된 하우스형속에 내장하여 알칼리수들 살균정수 하도록 구성한 것으로 본 고안을 첨부한 도면과 함께 상세히 설명하면 다음과 같다.

제 2 도는 본 발명에 따른 필터를 설치한 이온정수기의 단면을 보인것으로 용기(1)의 중간에 무수한 구멍이 뚫린 격판(4)을 설치하여 +이온의 알칼리수를 생성하기 위한 음극실(2)과, -이온의 산성수를 생성하기 위한 양극실(3)을 형성하여 상기 각각의 실(2)(3)의 하단에는 배수를 위한 유출공(2a)(3a)을 형성한다. 형성하는 음극실(2)에는 필터(8)를 내장한 플라스틱의 하우스형(9)을 장입시켜 여과 및 살균기능을 수행토록하며 DC 전압에 의한 양극(5)을 양극실(3)에 걸고 음극(6)을 음극실(2)에 걸어 용수의 전기분해기능을 수행할 수 있게 한다.

상기의 양극(5)과 음극(6)을 형성함에 있어, 통상적으로 양극(5)에는 페라이트 전극을 사용하고 음극(6)에는 스테인레스 전극을 사용한다. 이러한 구성중 필터(8)의 구성을 살펴보면 제 3 도와 같이 동기성이 있는 상하 부직포(11')(11'')사이에서 은첨가 활성탄(12')과 미처리 활성탄(12'')을 교호 반복적인 배열로 장입시켜 필터(8)를 형성한다. 필터(8)를 형성함에 있어, 부직포(11')(11'')의 한측면에 접착제를 도포하고 접착제가 처리된 면이 활성탄쪽으로 향하게 하여 열용착시켜 활성탄들은 고정한다.

이러한 접착으로 물에 의한 부직포의 부풀음이 방지되며 활성탄의 메시(Mesh)보다가는 부직포의 70H쉬에 의해 활성탄의 이탈이 방지된다.

그리고 본 발명 구성중 주요부품의 하나인 은첨가 활성탄(12')제조는 먼저 1리터의 농근 플라스크에서 수용성인 질산은( $\text{AgNO}_3$ )과 같은 온염을 중량비 10-20%로하고 중류수는 80-90%로하는 수용액을 만든다. 이 수용액에 건조된 활성탄을 상온에서 10-20분간 침적시킨 후 중류수로서 3-4차례 세척하여 반응되지 않은 여분의 온염을 세척한다.

이때 처리된 활성탄에서의 은성분은 물에서 용해성을 지니고 있어서 쉽게 용출되어 나오므로 장시간 사용이 불가하다. 따라서 은 성분을 안정화 시킬 수 있는 공정이 필요하여 온염으로 처리된 활성탄을 반응은 용액( $\text{AgNO}_3$ )

3) 또는 염화은( $\text{AgCl}_2$ )과 같은 당량의 난용성 할로젠염인 염화나트륨( $\text{NaCl}$ )용액에 30분간 침적하여 추출해낸후, 3-4차례 중류수로 수세하여 염화나트륨 용액의 염소성분을 제거하고 100°C 내지 120°C온도의 건조로에서 건조시키면 은첨가 활성탄이 제조되는 것이다.

이렇게 제조된 은첨가 활성탄의 용합량비는 0.3-0.5%지나 물에서 은이온이 극히 미량으로 되며 용출된 은이온은 살균작용을 하는 것이다. 상기에서 살균용으로 사용되는 금속성분을 은으로 선택한 것은 동일한 살균작용을 하는 금이나 동은 가격면이나 사용용도면에 맞지않기 때문에 은을 사용하는 것으로 금은 가격이 비싸 실용성이 없으며, 동은 수처리용에서 산화형태로 바뀌므로 용수에 녹물이 배어나와 인체에 해를 줄 염려가 있어 부적합하지만 은은 가격도 적당하고 인체에도 해가 없는 특성이 있다.

이러한 은 첨가 활성탄(12')도 정수 및 살균을 처리할때 필터(8)에 의해 물에서 저항이 생기는 이유로 저항을 최소로 줄이기 위해서 활성탄의 입도를 6 내지 10메쉬의 입도로 형성한다.

상기 제조방법에 의해 형성되는 은첨가 활성탄은 제 4 도와 같이 흡착능력을 가지는 미세한 기공(13)이 다소 손상을 입게되므로 살균성능은 우수하게 되지만 유기물을 흡착할 수 있는 흡착능력이 미처리 활성탄에 비해 다소 떨어지게 된다.

그러므로 뒤떨어지는 흡착능력을 증가시키기 위하여 미처리된 일반활성탄(12")을 음전극 활성탄과 거의 같은 비율로 접촉제가 일면에만 처리된 부직포(11')(11")사이에 배열하여 진술한 바와같이 열융착하여 필터(8)를 형성한다.

이러한 방법으로 만들어진 필터(8)를 제 5 도와 같이 상하면 (9')(9")에 유로통(10)을 형성한 플라스틱의 하우징(9) 내에 내장하여서 된 것이다. 이와같이 구조로 이루어진 본 발명의 필터(98)가 내장된 하우징(9)을 음극실(2)에 설치하여 DC 전원을 인가하면 전압에 의해서(+)전극인 페라이트 전극쪽으로(-)이온이 전리되어가며, (-)전극인 스테인레스 전극쪽으로는(+)이온이 전리되어가서 양극실(3)에서는 산성수가 음극실(2)에는 알칼리수가 생성된다.

이 과정에서 음극실(2)에서는 미소하게 용출되는 음의 금속성분으로 잔존하는 세균의 살균작용을 하고 일반적인 활성탄(12")과 부직포(11')(11")로 유기물을 여과하는 작용을 이루어 하우징(9)의 유로통(10)을 통해 유출공(2a)에서 배출되는 알칼리수는 매우 위생적인 것이다.

상기의 세균살균 작용에서 한예를 들면, 100cc 삼각 플라스크에 세균으로 오염된 우물을 50cc를 채취하여 넣고 본 발명의 처리공정에 의해 처리된 음전극 활성탄 5.5g 삼각플라스크에 침적시킨 후 플라스크의 마개를 닫고 24시간 방치시킨 후 1cc를 채취하여 한천배지의 사례에서 37°C의 배양기통 이용하여 배양시키면 시험전 1cc에 1,400마리 이던 일반 세균수가 완전살균된 상태로 나타났다.

이들 종래의 것과 비교하여 보면 본 발명의 이온수기의 알칼리수에서의 살균능력은 전기분해 시간이 30분 지났을 때 물 1cc에 잔존하는 일반세균수가 100마리로 나타나지만 본 발명의 필터(8)를 사용한 때에는 30분 경과후 1cc당 3마리까지 살균된 것을 제 6 도에 의해 알수 있는 것이다.

이상에서와 같이 본 발명은 이온수기의 음극실에 음전극과 일반적인 활성탄을 설치한 필터를 삽입하여 인체에 해가 없고 세균의 살균과 유기물의 여과기능을 상승시켜 좋은 알칼리수가 공급되게 한 효과가 있는 것이다.

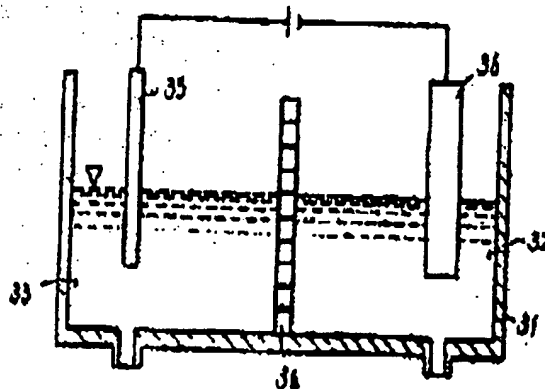
## (57) 청구의 범위

### 청구항1

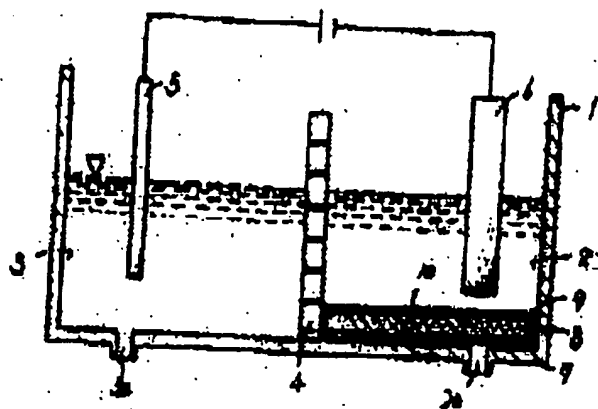
통기성이 좋고 한쪽면에 접촉제를 도포한 상하의 부직포(11')(11")사이로 수용성 음염의 일정량을 흡착시킨다음 같은 당량으로 염화나트륨을 반응시켜서된 음전극 활성탄(12')과 미처리 활성탄(12")을 교호 반복적인 배열로 장입시켜 부직포(11')(11")를 열융착하여서된 이온수기용 살균, 점수 필터.

도면

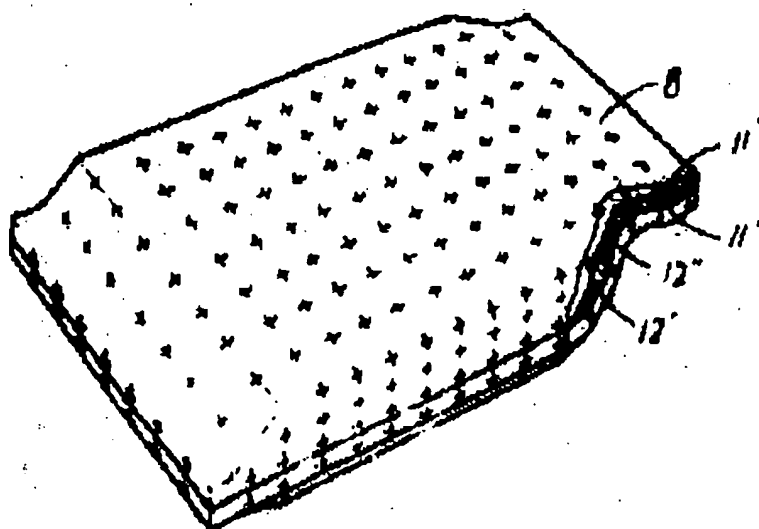
도면1



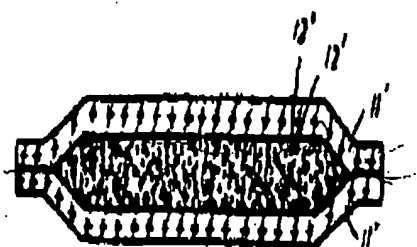
도면2



도면3-가

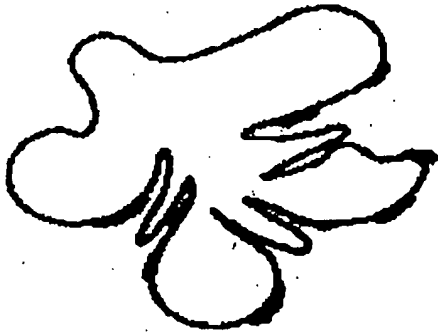


도면3-나

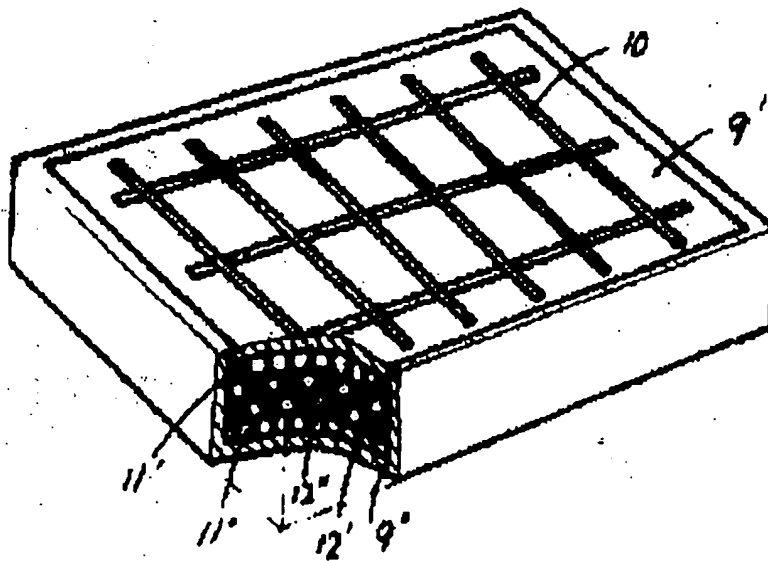


도면4

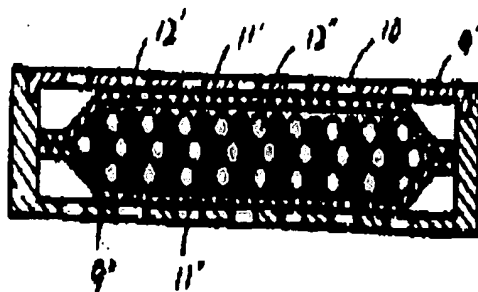




도면5-가



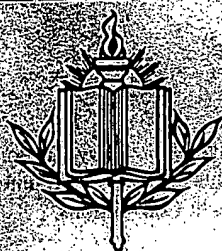
도면5-나



도면6



# WEBSTER'S UNIVERSAL COLLEGE DICTIONARY



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## drumfish to duck

**birds** to produce a sound resembling drumming. —*v.t.* 15. to beat (a drum) rhythmically; perform by beating a drum. 16. to call or summon by or as if by beating a drum. 17. to drive or force by persistent repetition: to *drum an idea into someone*. 18. to fill a drum with; store in a drum. 19. **drum out**, *a.* to expect or dismiss from a military service in disgrace to the beat of a drum; *b.* to dismiss in disgrace. 20. **drum up**, *a.* to call or summon by or as if by beating a drum. *b.* to obtain or create (trade, interest, etc.) through vigorous effort. *c.* to concoct; devise. —*Idiom*. 21. **beat the drum for**; to publicize: *beating the drum for a new product*.

**drumfish** (drum/fish) *n.* *pl.* (esp. collectively) *-fish*, (esp. for kinds or species) *-fishes*, *-drum* (def. 1).

**drum-major** (drum/maj) *n.* the leader of a marching band.

**drummer** (drum/er) *n.* 1. a person who plays a drum. 2. a commercial traveler or traveling sales representative.

**drum-roll** (drum/rol) *n.* 1. a roll on a drum. 2. the sound of a drum-roll.

**drum-stick** (drum/stik) *n.* a stick for beating a drum. 2. the meaty leg of a chicken or turkey or other fowl.

**drunk** (drunk) *adj.* 1. being in a temporary state in which one's physical and mental faculties are impaired by an excess of alcoholic drink; intoxicated. 2. overcome or dominated by a strong feeling or emotion: *drunk with passion*. 3. pertaining to or caused by intoxication or intoxicated persons. —*n.* 4. a. an intoxicated person. *b.* DRUNKARD. 5. a period of drinking alcohol heavily. —*adv.* 6. *long drunk*. —*v.* 6. pp. and non-standard pl. of DRINK.

**drunkard** (drunk/ard) *n.* a person who is habitually or frequently drunk.

**drunk-en** (drunk/en) *adj.* 1. intoxicated; drunk. 2. given to drunkenness. 3. pertaining to, caused by, or marked by intoxication: *a drunken quarrel*. —*drunk-en-ly*, *adv.* —*drunk-en-ness*, *n.*

**drunk-o-meter** (drunk/om-eter) *n.* a device for measuring the amount of alcohol in a person's breath to determine the amount of alcohol in the bloodstream.

**drupe** (drupe) *n.* any fruit consisting of an outer skin or husk, pulpy and succulent middle layer, and a hard and woody inner shell just enclosing a single seed, as a peach, cherry, or plum. —*drupa-ceous*, *adj.*

**druse** (druze) *n.* an incrustation of small crystals on the surface of a rock or mineral.

**druth-ers** (druth/ers) *n.* *Informal*. one's own way, choice, or preference: *If I had my druthers, I'd dance all night*.

**dry** (dri) *adj.* **dry-er**, **dry-est**, *v.* **dried**, **dry-ing**. *n.* *pl.* **dry-s**, **dries**. —*adj.* 1. free from moisture or excess moisture; not moist; not wet. 2. having or characterized by little or no rain: *the dry season*. 3. characterized by absence, deficiency, or failure of natural or ordinary moisture. 4. not under, in, or on water: *to be on dry land*. 5. not now containing or yielding water or other liquid; depleted or empty of liquid: *the well is dry*. 6. not yielding milk: *a dry cow*. 7. free from tears: *dry eyes*. 8. drained or evaporated away: *a dry river*. 9. desiring drink; thirsty. 10. causing thirst: *dry work*. 11. served or eaten without butter, cream, etc.: *dry toast*. 12. (of bread, rolls, etc.) stale. 13. of or pertaining to non-liquid substances or commodities: *dry measure*; *dry provisions*. 14. dehydrated. 15. (esp. of wines) not sweet. 16. (of a cocktail) made with dry vermouth; esp. a relatively small amount. 17. characterized by or favoring prohibition of the manufacture and sale of alcoholic liquors (or use in beverages): *a dry state*. 18. free from the use of alcoholic drink; sober. 19. plain; bald; unadorned: *dry facts*. 20. dull; uninteresting: *a dry subject*. 21. expressed in a straight-faced, matter-of-fact way: *dry humor*. 22. indifferent; cold; unemotional: *a dry answer*. 23. unproductive: *The greatest of artists have dry years*. 24. (of lumber) fully seasoned. 25. a. (of masonry construction) built without fresh mortar or cement. *b.* (of a wall, ceiling, etc., in an interior) finished without the use of fresh plaster. —*v.t.* 26. to make dry; free from moisture: *to dry the dishes*. —*v.i.* 27. to become dry; lose moisture. 28. **dry out**, to undergo detoxification after drug or alcohol abuse. 29. **dry up**, *a.* to cease to exist; evaporate. *b.* *Informal*. to stop talking. *c.* (in acting) to forget one's lines or part. —*n.* 30. a prohibitionist. 31. a dry area. —*dry-a-ble*, *adj.* —*dry-ly*, *adv.* —*dry-ness*, *n.*

**dry-ad** (dri/ad) *adj.* *n.* *pl.* **-eds**, **-a-des** (-ə-dēz). (*often Cap.*) a nymph of the woods. —*dry-ad-ic*, *adj.*

**dry-as-dust**, *adj.* dull; boring.

**dry-cell**, *n.* a cell in which the electrolyte exists in the form of a paste, is absorbed in a porous medium, or is otherwise restrained from flowing.

**dry-clean-ing**, *n.* 1. the cleaning of garments, fabrics, draperies, etc., with chemicals rather than with water. 2. garments and other items for such cleaning. —*dry/-clean*, *v.t.* —*cleaned*, *-clean-ing*. —*dry/-clean-a-ble*, *adj.*

**dry-dock**, *n.* a structure able to contain a ship, leaving all parts of the hull accessible for repairs, painting, or construction.

**dry-er** (dri/er) *n.* 1. Also: **drier**; a machine, appliance, or apparatus for removing moisture, as by forced ventilation or heat. 2. *orient* (def. 1, 2).

**dry-eyed**, *adj.* not weeping; unmoved.

**dry-goods**, *n. pl.* textile fabrics and related merchandise, as distinguished esp. from groceries and hardware.

**dry-ice**, *n.* the solid form of carbon dioxide, which sublimates at -109.26°F. (-78.48°C) and is used chiefly as a refrigerant.

**dry-ing-oil**, *n.* any of a group of oily, organic or synthetic liquids, as linseed oil, that when applied as a thin coating absorb atmospheric oxygen, forming a tough, elastic layer.

**dry/land farm-ing** (dri/land) *n.* a mode of farming in which there is scant rainfall, relying on suitable crops and methods.

**dry-meas-ure**, *n.* the system of volumetric dry commodities, as grain.

**dry-milk**, *n.* powdery milk from which about 90 percent of the moisture has been evaporated.

**dry-nurse**, *n.* 1. a nurse who takes care of another's infant. Compare *wet nurse*. 2. *Informal*. and guides an inexperienced person at a task. —*nursed*, *-nurs-ing*.

**dry-roast-ed** or **dry-roast**, *adj.* roasted: *dry-roast-ed peanuts*.

**dry-rot**, *n.* 1. a decay of seasoned lumber, caused by fungi, resulting in brittle and crumbling to a dry powder, caused by various diseases of plants in which the rotted tissue is concealed or unsuspected inner decay.

**dry-run**, *n.* 1. a rehearsal. 2. practice in firing a gun or machine gun. —*dry-run*, *adj.*

**dry-wall**, *n.* 1. Also, **dry-wall**. a. an interior wall made of a noncombustible, non-liquid material. *b.* a material, as wallboard or sheetrock, used in the construction of such a wall. 2. a masonry or stone wall laid up without mortar. —*v.t.* —*walled*, *-wall-ing*, *adj.*

**D.S.**, *Music*. from the sign: [*< It dal segno*].

**DST** or **D.S.T.**, daylight-saving time.

**DTP**, 1. diphtheria, tetanus, and pertussis. See *D.T.P.*

**d.t.s** or **D.T.s** (dē/tēz), *n.* DELIRIUM TREMENS.

**du-ad** (dū/ad, dyū/-), *n.* a group of two, coupled or connected.

**du-al** (dū/al, dyū/-), *adj.* 1. of, pertaining to, composed of, or consisting of two people, items, parts, etc.: *du-al ownership*. 2. having a twofold or double nature. —*n.* 4. *Gram.* the dual number. 5. a dual. —*du-al-ly*, *adv.*

**du-al-cit-iz-en-ship**, *n.* the status of a person who is a citizen of two or more countries.

**du-al-ism** (dū/ə-liz-əm, dyū/-), *n.* 1. the state of being of two parts; division into two. 2. a. (in metaphysics) theories holding that reality is composed of two distinct parts or substances. Compare *MONISM* (def. 1a), *PLURALISM* (def. 1a). *b.* the view that substances are either material or immaterial. *c.* a theological doctrine that there are two eternal principles, one good and one evil. *d.* the belief that humans embody two natures. —*du-al-ist*, *n.*, *adj.*

**du-al-is-tic** (dū/ə-lis/tik, dyū/-), *adj.* 1. of, pertaining to, or characterized by dualism. 2. dual; twofold. —*du-al-is-ti-cally*, *adv.*

**du-al-ity** (dū/al-i-tē, dyū/-), *n.* a dual state or condition.

**du-al-pur-pose**, *adj.* 1. serving two functions or purposes, as to provide meat and milk or meat and vegetables. —*v.* 2. *dubbed*, *dub-bing*. —*v.t.* 1. to give a nickname, or title: *He was dubbed a hero*. 2. to confer knighthood in the ceremony of conferring knighthood. 3. to strike; cut; rub; or make smooth. —*dub-ber*, *n.*

**dub** (dub) *n.* *Slang*. an awkward, unskillful person.

**dub** (dub) *v.* *dubbed*, *dub-bing*. —*v.t.* 1. to hit (a golf ball) poorly; misplay (a shot). 2. to execute poorly. —*n.* 5. a thrust; poke.

**dub** (dub) *v.* *dubbed*, *dub-bing*. —*v.t.* 1. to give a new sound track, as one recorded in the language of import. 2. to add (music, speech, etc.) to a film or tape. 3. to copy (a tape or disc). —*n.* 4. a film or tape. —*dub-ber*, *n.*

**du-bi-ety** (dū/bi-ē-tē, dyū/-), *n.* *pl.* *-ties*. 1. doubt; uncertainty. 2. matter of doubt.

**du-bi-ous** (dū/bi-əs, dyū/-), *adj.* 1. marked by or characterized by doubt; equivocal: *a dubious reply*. 2. of doubtful quality or value: *a dubious compliment*. 3. of uncertain opinion; opinion: *Inclined to doubt; hesitant*. —*du-bi-ous-ly*, *adv.*

**du-bi-ta-ble** (dū/bi-tə-bel, dyū/-), *adj.* open to doubt; doubtful. —*du-bi-ta-bly*, *adv.*

**du-cal** (dū/kəl, dyū/-), *adj.* of or pertaining to a duke.

**du-ce** (dū/chā), *n.* *pl.* *-ces*, *-ci* (-chē). 1. a leader or guide. 2. a reward. —*v.t.* 3. to lead or guide. —*du-cer*, *n.*

**duch-ess** (dūch/is), *n.* 1. the wife or widow of a duke. 2. a woman who holds the rank of a duke in her own right.

**duch-y** (dūch/ē), *n.* *pl.* *-duch-ies*. the territory ruled by a duke.

**duck** (duk) *n.* *pl.* *ducks*, (esp. collectively for 1, 2) *-ducks*. 1. a member of the family Anatidae, characterized by a broad, flat bill, and this bird, as distinguished from the male. Compare *GOOSE*. 2. a blow, unpleasant task, etc.; dodge. 3. to plunge the head momentarily under water. —*v.t.* 4. to lower suddenly. 5. to avoid or evade (a blow, unpleasant task, etc.). 6. to plunge or dip in water momentarily. —*n.* 7. *and* *duck-ling*. —*duck-or*, *n.*

**duck** (duk) *n.* 1. a heavy plain-weave cotton fabric, as duck cloth, used with a pl. v. slacks or trousers.

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METHOD FOR PRODUCING STERILIZATION DEVICE FOR WATER-PURIFIER USE  
[Josuikiyo Mekkinsoshi No Seizohoho]

Masayoshi Mioda, et al.

UNITED STATES PATENT AND TRADEMARK OFFICE  
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## SPECIFICATION

### 54. Title

METHOD FOR PRODUCING STERILIZATION DEVICE FOR WATER-PURIFIER USE

### 57. Claims

1. A method for producing a sterilization device for water-purifier use, said method comprising applying a resin adhesive onto a substrate, attaching hardly-soluble silver-salt particles having a sterilization effect onto it before this resin adhesive is hardened, applying a pressure to the aforesaid hardly-soluble silver-salt particles so as to push them into the aforesaid resin adhesive, and subsequently hardening the aforesaid resin adhesive, thereby bonding the aforesaid hardly-soluble silver-salt particles to the substrate.

#### [Detailed Description of the Invention]

The object of the present invention is to add a sterilization function to commercially available water purifiers. More specifically, it intends to sterilize filtered water that is obtained by eliminating chlorine gas, bleaching powder, and the like contained in cities' tap water with active carbon in water purifiers. In particular, it intends to impart a sterilization function to water purifiers with the use of a silver salt that is hardly soluble in water--for example, silver chloride, silver bromide, or silver iodide.

None of the water purifiers that are currently available on the market has a sterilization function. However, when the intended purpose of tap water is considered, with currently available water

purifiers, the infestation of common germs and coliform bacteria could occur in the filtered-water section of water purifiers as a result of careless handling because filtered water, which results from eliminating chlorine and bleaching powder with active carbon, does not have a sterilizing ability. In view of this danger of bacterial contamination, there is a need for providing a sterilization device for commercially available water purifiers. There are various disinfectants that can be used for water, but, considering the intended purpose of water purifiers, they should not affect the taste of water, and silver salts that are hardly soluble in water are considered suitable. From the standpoint of the solubility of silver salts, silver chloride (solubility in water:  $10^{-5}$  mol/L), silver bromide (solubility in water:  $10^{-6}$  mol/L), and silver iodide (solubility in water:  $10^{-8}$  mol/L) are selected, and the case of using silver chloride is described in the following.

As conceivable ways to add a sterilizing ability to household-use water purifiers, there are a method of mixing silver chloride powder into active carbon and a method of adsorbing silver chloride to active carbon. These methods, however, have various disadvantages. Namely, in the case of a water purifier in which a filter fabric containing powdered active carbon and a water-collecting pipe are integrated into one piece, there are the following disadvantages.

- (1) The active carbon particles other than those that are effectively precoated onto the surface of the filter fabric



precipitate to the bottom of the cartridge having the filter fabric layer, and the silver chloride that is adsorbed to or mixed with the precipitated active carbon is scarcely utilized.

(2) Active carbon has an absolute specific gravity of 2.0 and an apparent specific gravity of approximately 0.20, while the absolute specific gravity of silver chloride is 5. Due to this substantial difference in their specific gravities, silver chloride powder separates from active carbon and precipitates to the bottom of the cartridge having the filter fabric layer, which fact translates into poor utilization of silver chloride. In addition, it is difficult to dissolve out  $\text{Ag}^+$  ions constantly in an amount that is necessary to sterilize germs.

(3) Even if active carbon containing silver chloride is uniformly precoated over the surface of the filter fabric layer, because the quantity of  $\text{Ag}^+$  ions that are initially dissolved out is large, there is a tendency for the quantity of dissolved  $\text{Ag}^+$  ions to rapidly decrease with use. There are two conceivable causes for this. One is that the surface of active carbon is precoated with foreign matter, and this contamination causes the reduction of dissolved  $\text{Ag}^+$  ions. The other is that adsorbing silver chloride in a thick layer to the surface of active carbon causes the capability of the active carbon proper to deteriorate, thus rendering it unusable for water purifiers. Even if it is adsorbed thinly, the ions are dissolved out in a large

quantity initially, and silver chloride could run out before the life of the active carbon.

(4) It is extremely difficult to check the degree of adsorption of active carbon for the purpose of quality control.

(5) There is a conceivable danger that minute silver chloride particles flow into the filtered water in a colloidal form and are ingested by human beings.

(6) Household-use water purifiers do not need to have a disinfectant inserted into it on the active-carbon side of the filter fabric, that is, the water-source side, for a sterilization purpose because chlorine or bleaching powder is present on that side. Infestation of germs occurs on the water collecting side inside cities [sic] through which the filtered water passes.

Considering the aforesaid characteristics of silver chloride and the structure of water purifiers, the present invention provides a method for producing a sterilization device that sterilizes germs when installed on the filtered-water side (or in the vicinity of the water-collecting pipe in the filter fabric if the filter fabric and the water-collecting pipe are constructed in one piece) of a commercially available water purifier, thus rendering it useful for water purifiers.

The following explains one embodiment of the present invention in concrete terms, referring to figures.

In the figures, reference numeral 1 indicates a sealed cylindrical case, which is composed of a case proper (2) and a lid (3).

At the bottom of the case proper (1) is formed an inflow hole (4) that connects to a water line, and a faucet (5) is provided at the center of the lid (3) in a rotatable manner. Reference numeral 6 indicates a cartridge that is housed in the case (1). It is made from a synthetic resin and formed in a cylindrical shape, and it has ports (7, 7) at its under surface. There is a space (8) provided between this cartridge (6) and the case (1). Reference numeral 9 indicates a filtering body that is housed inside the cartridge (6), and it is constructed by wrapping a coarsely meshed porous resin frame (10) that is formed in a long rectangular shape with a filter fabric made of a close-grained cloth comprised of resin fibers and by sealing the opening with a resin adhesive. At the center of this filtering body (9) is inserted the lower portion of a resin-made water-collecting pipe (12), and the portion of the water-collecting pipe (12) that is positioned inside the filtering body (9) has a large number of water-collecting holes (13). This filtering body (9) is housed in a serpentinely bent condition, as shown in Fig. 2, inside the cartridge (6). The top end of the water-collecting pipe (12) runs through the cartridge (6) and connects to the faucet (5). Reference numeral 14 indicates active carbon powder that is placed inside the cartridge (6). Reference numeral 15 indicates a seal for closing the ports (7, 7) so as to prevent the active carbon powder (14) from leaking out from the cartridge (6). It normally has the same property as that of common paper, but, once it is wetted with water, it dissolves in a few

seconds. Reference numeral 16 indicates an air vent hole that is provided at the top part of the case (1); 17, its plug; 18, an air vent hole that is provided at the top of the cartridge (6); and 19, a filter that seals air vent hole 18. This filter has a porosity that allows air and water to pass through it but does not allow the active carbon powder (14) to pass through. Reference numeral 20 indicates a film-shaped sterilization device that is prepared by bonding hardly-soluble silver-salt particles as the disinfectant to a substrate by means of an adhesive, and it is inserted into some part of the resin-made frame (10). This sterilization device (20) is, as shown in Fig. 6e, a film-shaped device that is prepared by bonding hardly-soluble silver salt particles (23) to a flexible substrate (21) by means of a resin adhesive (22). It is configured in such a way that the hardly-soluble silver-salt particles (23) that are bonded by means of the resin adhesive (22) are exposed to the surface so as to make contact with filtered water.

The following explains the operation of the water purifier thus configured. When water is supplied through the inflow hole (4) from a water line, the water-soluble seals (15, 15) are dissolved, thus opening the ports (7, 7). As a result, the tap water enters the cartridge (8 [sic]) through the ports (7, 7) and stirs the active carbon powder (14) and subsequently precoats the external surface of the filtering body (9) with the active carbon powder (14) as the water flows into the filtering body (9), thereby forming an active carbon

powder layer on the external surface of the filtering body (9). As a result, the tap water is filtered by the active carbon powder layer (14), thus eliminating bleaching powder, chlorine gas, etc., contained in the water. The water, after being filtered, passes inside the filtering body (9) and is collected at the portion of the water-collecting pipe (12) where there are water-collecting holes (13), after which the water flows through the water-collecting pipe (12) and is supplied to the outside from the faucet (5). Meanwhile, the hardly-soluble silver-salt particles of the sterilization device that is placed inside the filtering body (9) in an area near the water-collecting pipe (12) and in other areas as necessary dissolve gradually into the water, and the resulting  $\text{Ag}^+$  ions perform sterilization inside the water purifier. As a result, the possibility of infestation of germs inside the water purifier can be eliminated. A water purifier in which was embedded this sterilization device prepared by bonding hardly-soluble silver salt particles by means of resin adhesive was actually installed in an up/down passage [sic], and the content of the  $\text{Ag}^+$  ions in the initial fraction of the filtered water was measured after the passage of 24 hours and found to be 45 ppb. Into this filtered water in which these  $\text{Ag}^+$  ions were present, coli bacteria (Escherichia Coli K-IZ-A) whose concentration was adjusted to  $6 \times 10^8$  cells/mL were added. It was confirmed that the coli bacteria were killed completely within 6 hours of the addition.

The following explains the sterilization device of the present invention used for water purifiers. This sterilization device is produced as shown in Figs. 6 a through e. More specifically, an adhesive (22) is applied to the surface of a flexible resin substrate (21), such as Mylar film, etc., having a thickness of 80  $\mu$  or thereabouts by common screen printing. As the adhesive (22), epoxy resin adhesives are used, but it goes without saying that, besides these, any adhesive can be used as long as it exhibits good affinity with the flexible resin substrate to be used. The application of the adhesive (22) is accomplished by roller printing or brush coating. The epoxy resin adhesive (22) used here is composed of 42 g Epicoat 828 (a product name), 18 g Adeca Resin EP-4000 (a product name), and 40 g Epomate B-002 (a product name). Next, silver chloride particles (23) are sprinkled over the aforesaid adhesive (22), and, using a Mylar film (24) and a pressure roller (25), the aforesaid silver chloride particles (23) are pushed into the aforesaid adhesive (22), thus attaching the aforesaid silver chloride particles (23) to the resin adhesive by pressure. Thereafter, excess silver chloride particles (23) are eliminated by applying vibration to them, and the adhesive is hardened at 100 °C for 2 hours, thereby bonding the silver chloride particles (23) securely. With respect to these hardening conditions, if the resin adhesive (22) is a normal-temperature hardening type, heating is not required. Thereafter, the weakly-bonded silver chloride particles, that is, the silver chloride particles that have not been

held with the adhesive, are eliminated forcefully, using a wire brush (not shown in the figures). In a sterilization device (20) that was obtained in this manner, silver chloride particles were bonded at a rate of  $0.012 \text{ g/cm}^2$  or thereabouts. The bonding rate of the silver chloride particles (23) can be easily controlled by controlling the thickness of the resin adhesive (22) and the particle size of the silver chloride particles (23). This, however, is not related much to the after-mentioned quantity of silver dissolved from silver chloride and is not an important issue in production. This sterilization device was cut into various sizes and attached to the resin-made frame (10) of the filtering body (9) of a water purifier, and the quantity of the dissolved  $\text{Ag}^+$  ions was measured. The following table shows the quantity of the  $\text{Ag}^+$  ions dissolved out from the sterilization device of each size as a function of time.

Dissolving Time (hr)	AgCl Attached Area ( $\text{cm}^2$ )	Absolute Quantity (g) of Attached AgCl	Quantity (ppb) of Dissolved $\text{Ag}^+$ Ions
3	18	0.243	45
8	18	0.243	45
15	18	0.243	45
15	9	0.120	45
15	32	0.425	45
15	90	1.200	45

The quantity of dissolved  $\text{Ag}^+$  ions was measured by atomic absorption analysis, using an atomic absorption analyzer manufactured by Beckman Co.

In the aforesaid embodiment, silver chloride particles as the disinfectant were bonded on one side of a substrate by means of an

adhesive, but it goes without saying that they can be bonded on both sides of a substrate in the same manner.

As is evident from the explanation in the foregoing, according to the present invention, hardly-soluble silver-salt particles are bonded to a substrate with the use of an adhesive; therefore, the hardly-soluble silver-salt particles can be held by the substrate securely. Consequently, a sterilization device that is made according to this method does not have the problem of separation of hardly-soluble silver-salt particles caused by water pressure, etc., when it is housed inside a water purifier. Furthermore, it can eliminate the problem of peeling completely, compared with devices obtained by vapor deposition, etc.

Compared with the method of mixing a silver salt with active carbon, the present invention can provide a sterilization device that yields a stable quantity of dissolved  $\text{Ag}^+$  ions. Since this device is produced by forming a layer of an adhesive on a substrate, sprinkling hardly-soluble silver-salt particles over it, and by applying a pressure so as to push them into the adhesive layer, it is extremely easy to form a layer of silver-salt particles on the surface of the adhesive layer. It is also possible to prevent the hardly-soluble silver-salt particles from being completely buried in the adhesive layer by selecting the applied pressure; therefore, the silver salt can be utilized highly effectively.



[Brief Explanation of the Drawings]

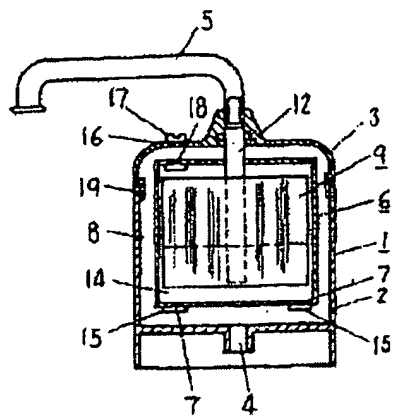
Fig. 1 is a cross-sectional drawing of the water purifier pertaining to the present invention. Fig. 2 is a perspective view of the filtering body of the aforesaid water purifier. Fig. 3 is a center-section drawing of the filtering body. Figs. 4 and 5 are an enlarged plan view and enlarged cross-sectional view, respectively, of the filtering body for illustrating the way the sterilization device is installed. Figs. 6 a through e are drawings for explaining the method for producing the sterilization device for water-purifier use that is one embodiment of the present invention.

20 ... sterilization device, 21 ... substrate, 22 ... resin adhesive, 23 ... hardly-soluble silver-salt particles.

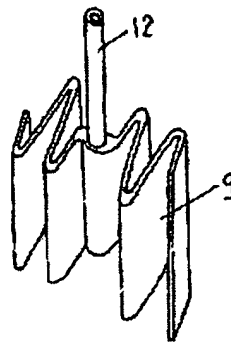
56. Cited Literature

United States Patent No. 3,327,859

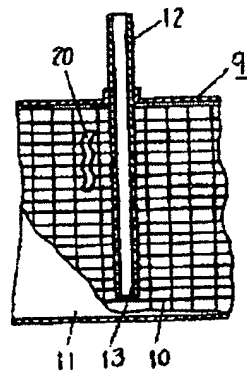
[FIG. 1]



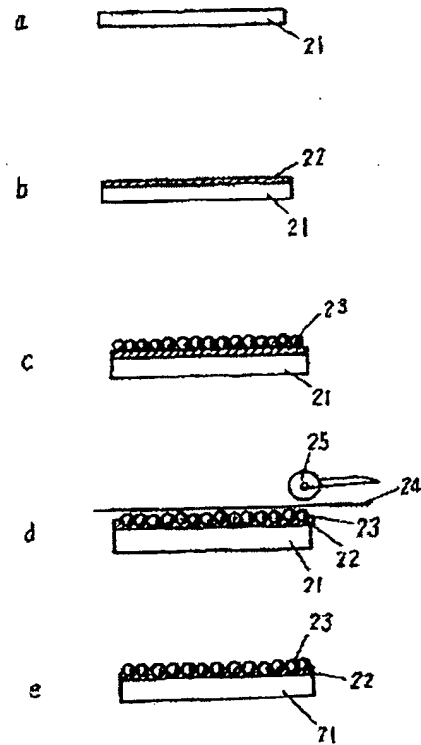
[FIG. 2]



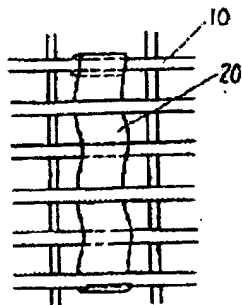
[FIG. 3]



[FIG. 6]



[FIG. 4]



[FIG. 5]



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STERILIZATION DEVICE FOR WATER-PURIFIER USE  
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## SPECIFICATION

### 54. Title

STERILIZATION DEVICE FOR WATER-PURIFIER USE

### 57. Claims

1. A sterilization device for water-purifier use, said device having a powder of a sintered compact that is a mixture of a salt that contains positive ions or negative ions having a sterilizing effect and of glass, a synthetic resin that functions as an adhesive, and a substrate for supporting these and said device being prepared by bonding the aforesaid sintered-compact powder to the aforesaid substrate with the use of the aforesaid synthetic resin.

#### [Detailed Description of the Invention]

The object of the present invention is to add a sterilization function to commercially available water purifiers. More specifically, it intends to sterilize filtered water that is obtained by eliminating chlorine gas, bleaching powder, and the like contained in cities' tap water with active carbon in water purifiers. In particular, it intends to impart a sterilization function to water purifiers with the use of a silver salt that is hardly soluble in water--for example, silver chloride, silver bromide, or silver iodide.

None of the water purifiers that are currently available on the market has a sterilization function. However, when the intended purpose of tap water is considered, with currently available water purifiers, the infestation of common germs and coliform bacteria could

occur in the filtered-water section of water purifiers as a result of careless handling because filtered water, which results from eliminating chlorine and bleaching powder with active carbon, does not have a sterilizing ability. In view of this danger of bacterial contamination, there is a need for providing a sterilization device for commercially available water purifiers. There are various disinfectants that can be used for water, but, considering the intended purpose of water purifiers, they should not affect the taste of water, and silver salts that are hardly soluble in water are considered suitable. From the standpoint of the solubility of silver salts, the present invention selects silver chloride (solubility in water:  $10^{-5}$  mol/L), silver bromide (solubility in water:  $10^{-6}$  mol/L), and silver iodide (solubility in water:  $10^{-8}$  mol/L). As conceivable ways to add a sterilizing ability to household-use water purifiers with the use of, for example, silver chloride, there are a method of mixing silver chloride powder into active carbon and a method of adsorbing silver chloride to active carbon. These methods, however, have various disadvantages. Namely, in the case of a water purifier in which a filter fabric containing powdered active carbon and a water-collecting pipe are integrated into one piece, there are the following disadvantages.

(1) The active carbon particles other than those that are effectively precoated onto the surface of the filter fabric precipitate to the bottom of the cartridge having the filter fabric

layer, and the silver chloride that is adsorbed to or mixed with the precipitated active carbon is scarcely utilized.

(2) Active carbon has an absolute specific gravity of 2.0 and an apparent specific gravity of approximately 0.20, while the absolute specific gravity of silver chloride is 5. Due to this substantial difference in their specific gravities, silver chloride powder separates from active carbon and precipitates to the bottom of the cartridge having the filter fabric layer, which fact translates into poor utilization of silver chloride. In addition, it is difficult to dissolve out  $\text{Ag}^+$  ions constantly in an amount that is necessary to sterilize germs.

(3) Even if active carbon containing silver chloride is uniformly precoated over the surface of the filter fabric layer, because the quantity of  $\text{Ag}^+$  ions that are initially dissolved out is large, there is a tendency for the quantity of dissolved  $\text{Ag}^+$  ions to rapidly decrease with use. There are two conceivable causes for this. One is that the surface of active carbon is precoated with foreign matter, and this contamination causes the reduction of dissolved  $\text{Ag}^+$  ions. The other is that adsorbing silver chloride in a thick layer to the surface of active carbon causes the capability of the active carbon proper to deteriorate, thus rendering it unusable for water purifiers. Even if it is adsorbed thinly, the ions are dissolved out in a large quantity initially, and silver chloride could run out before the life of the active carbon.

(4) It is extremely difficult to check the degree of adsorption of active carbon for the purpose of quality control.

(5) There is a conceivable danger that minute silver chloride particles flow into the filtered water in a colloidal form and are ingested by human beings.

(6) Household-use water purifiers do not need to have a disinfectant inserted into it on the active-carbon side of the filter fabric, that is, the water-source side, for a sterilization purpose because chlorine or bleaching powder is present on that side. Infestation of germs occurs on the water collecting side inside cities [sic] through which the filtered water passes. Infestation of germs occurs on the water collecting side inside the fabric through which the filtered water passes.

Considering the aforesaid characteristics of silver salts and the structure of water purifiers, the present invention provides a sterilization device that sterilizes germs when installed on the filtered-water side (or in the vicinity of the water-collecting pipe in the filter fabric if the filter fabric and the water-collecting pipe are constructed in one piece) of a commercially available water purifier, thus rendering it useful for water purifiers.

The following explains one embodiment of the present invention in concrete terms, referring to figures. In the figures, reference numeral 1 indicates a sealed cylindrical case, which is composed of a case proper (2) and a lid (3). At the bottom of the case proper (1) is



formed an inflow hole (4) that connects to a water line, and a faucet (5) is provided at the center of the lid (3) in a rotatable manner. Reference numeral 6 indicates a cartridge that is housed in the case (1). It is made from a synthetic resin and formed in a cylindrical shape, and it has ports (7, 7) at its under surface. There is a space (8) provided between this cartridge (6) and the case (1). Reference numeral 9 indicates a filtering body that is housed inside the cartridge (6), and it is constructed by wrapping a coarsely meshed porous resin frame (10) that is formed in a long rectangular shape with a filter fabric made of a close-grained cloth comprised of resin fibers and by sealing the opening with a resin adhesive. At the center of this filtering body (9) is inserted the lower portion of a resin-made water-collecting pipe (12), and the portion of the water-collecting pipe (12) that is positioned inside the filtering body (9) has a large number of water-collecting holes (13). This filtering body (9) is housed in a serpentinely bent condition, as shown in Fig. 2, inside the cartridge (6). The top end of the water-collecting pipe (12) runs through the cartridge (6) and connects to the faucet (5). Reference numeral 14 indicates active carbon powder that is placed inside the cartridge (6). Reference numeral 15 indicates a seal for closing the ports (7, 7) so as to prevent the active carbon powder (14) from leaking out from the cartridge (6). It normally has the same property as that of common paper, but, once it is wetted with water, it dissolves in a few seconds. Reference numeral 16 indicates an air

vent hole that is provided at the top part of the case (1); 17, its plug; 18, an air vent hole that is provided at the top of the cartridge (6); and 19, a filter that seals air vent hole 18. This filter has a porosity that allows air and water to pass through it but does not allow the active carbon powder (14) to pass through.

Reference numeral 20 indicates a sterilization device that is prepared by bonding, as the disinfectant, a sintered-compact powder that is a mixture of a silver salt and glass to a substrate by means of an adhesive, and it is inserted into some part of the resin-made frame (10). This sterilization device (20) is, as shown in Fig. 6, a film-shaped device that is prepared by bonding a sintered-compact powder (21) that is a mixture of a silver salt and glass to a substrate (23) by means of an adhesive (22). It is configured in such a way as to expose the silver-salt-containing sintered-compact powder (21) that is bonded to the substrate (23) by means of the resin adhesive (22) at the surface.

The following explains the operation of the water purifier thus configured. When water is supplied through the inflow hole (4) from a water line, the water-soluble seals (15, 15) are dissolved, thus opening the ports (7, 7). As a result, the tap water enters the cartridge (6) through the ports (7, 7) and stirs the active carbon powder (14) and subsequently precoats the external surface of the filtering body (9) with the active carbon powder (14) as the water flows into the filtering body (9), thereby forming an active carbon

powder layer on the external surface of the filtering body (9). As a result, the tap water is filtered by the active carbon powder layer (14), thus eliminating bleaching powder, chlorine gas, etc., contained in the water. The water, after being filtered, passes inside the filtering body (9) and is collected at the portion of the water-collecting pipe (12) where there are water-collecting holes (13), after which the water flows through the water-collecting pipe (12) and is supplied to the outside from the faucet (5). Meanwhile, the silver salt that is placed inside the filtering body (9) in an area near the water-collecting pipe (12) and in other areas as necessary dissolve gradually into the water, and the resulting  $\text{Ag}^+$  ions perform sterilization inside the water purifier. As a result, the possibility of infestation of germs inside the water purifier can be eliminated. A water purifier in which was embedded this sterilization device was actually installed in water and sewerage systems [sic], and the content of the  $\text{Ag}^+$  ions in the initial fraction of the filtered water was measured after the passage of 24 hours and found to be 45 ppb. Into this filtered water in which these  $\text{Ag}^+$  ions were present, coli bacteria (Escherichia Coli K-12-A) whose concentration was adjusted to  $6 \times 10^8$  cells/mL were added. It was confirmed that the coli bacteria were killed completely within 6 hours of the addition.

The following explains the sterilization device of the present invention used for water purifiers. It is produced as follows. As the glass, soda quartz glass [as transliterated] is used. The composition

of this glass is 15 % by weight  $\text{Na}_2\text{O}$ , 15 % by weight  $\text{CaO}$ , and 70 % by weight  $\text{SiO}_2$ . This glass is pulverized and run through 150 mesh. To this glass is added  $\text{AgNO}_3$ ,  $\text{AgCl}$ , and Ag metal powder discretely and mixed, and each resulting mixture is formed by a press under a pressure of  $50 \text{ kg/cm}^2$ . Each formed product is baked at  $900^\circ\text{C}$ ,  $800^\circ\text{C}$ , or  $700^\circ\text{C}$  and subsequently pulverized, thereby forming a powder. The particle size of this powder is set to 150 mesh or smaller. To this powder is added an epoxy resin to form an enamel, and it is printed on a substrate comprised of Mylar film and baked at  $100^\circ\text{C}$  for 2 hours. The content of  $\text{AgCl}$ ,  $\text{AgNO}_3$ , or Ag metal powder in the glass here is set either to 50 % by weight or 80 % by weight. The resin used for forming the enamel is composed of 42 g Epicoat 815, 18 g Adeca Resin EP 4000, and 40 g Epomate B002. A sterilization device that was prepared in the aforesaid manner was immersed in water that had been run through a water purifier, and the quantity of dissolved  $\text{Ag}^+$  ions was measured.

The following table shows the quantity of the dissolved  $\text{Ag}^+$  ions that was obtained when the aforesaid sterilization device was cut into pieces having an area of  $3 \times 3 \text{ cm}^2$  and immersed into 20 cc filtered water. The quantity of dissolved  $\text{Ag}^+$  ions was measured by atomic absorption analysis, using an atomic absorption analyzer manufactured by Beckman Co.

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Type of Silver Salt and Its Content (wt %)	Dissolving Time (hr)	Quantity of Dissolved Ag <sup>+</sup> Ions (ppb)
AgNO <sub>3</sub> (50)	0.5	40
	1	45
	3	45
	5	45
AgNO <sub>3</sub> (80)	0.5	40
	1	45
	3	45
	5	45
AgCl (50)	0.5	40
	1	45
	3	45
	5	45
AgCl (80)	0.5	45
	1	45
	3	45
	5	45
Ag Powder (50)	0.5	40
	1	50
	3	45
	5	45
Ag Powder (80)	0.5	45
	1	45
	3	45
	5	50

In the aforesaid embodiment, a hardly-soluble silver salt as the disinfectant were bonded on one side of a substrate by means of an adhesive, but it goes without saying that they can be bonded on both sides of a substrate in the same manner.

As is evident from the explanation in the foregoing, according to the present invention, a silver salt used as the disinfectant is mixed with glass and formed into a sintered-compact powder, and this sintered-compact powder is bonded to a substrate with a resin

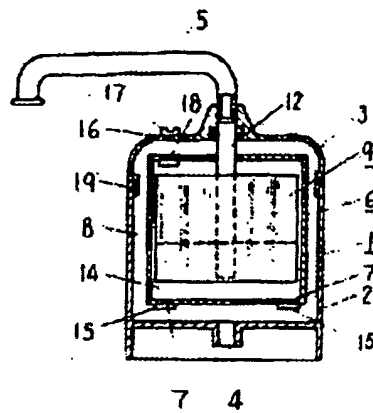
adhesive; therefore, the silver-salt particles are less likely to detach from the substrate or the adhesive, and, even if they did detach, they are harmless to human beings because they are coated with glass. Therefore, with this sterilization device, it is less likely that sintered-compact powder containing silver-salt particles is detached when it is housed on the filtered water side of a water purifier and exposed to water pressure, etc. Furthermore, it can eliminate the problem of peeling completely, compared with devices obtained by vapor deposition, etc. Compared with the method of mixing a silver salt with active carbon, the quantity of dissolved  $\text{Ag}^+$  ions is highly stable. By forming the substrate from a flexible film, the device can be installed or removed quite easily. Thus, the device has various excellent advantages.

[Brief Explanation of the Drawings]

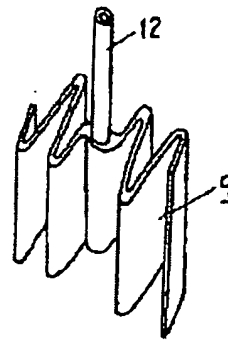
Fig. 1 is a cross-sectional drawing of the water purifier pertaining to the present invention. Fig. 2 is a perspective view of the filtering body of the aforesaid water purifier. Fig. 3 is a center-section drawing of the filtering body. Figs. 4 and 5 are an enlarged plan view and enlarged cross-sectional view, respectively, of the filtering body for illustrating the way the sterilization device is installed. Figs. 6 is an enlarged cross-sectional drawing of the sterilization device used in the aforesaid water purifier.

20 ... sterilization device, 21 ... sintered-compact powder,  
22 ... resin adhesive, 23 ... substrate.

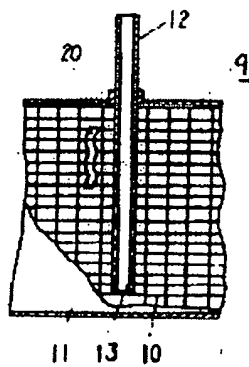
[FIG. 1]



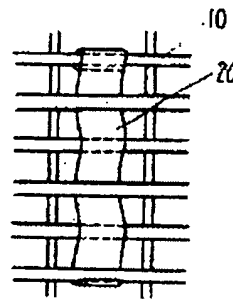
[FIG. 2]



[FIG. 3]



[FIG. 4]



[FIG. 5]



[FIG. 6]

